Dawson College: **Linear Algebra** (SCIENCE): 201-NYC-05-S1: Winter 2024: **Quiz 3** name: ____________________

Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531**. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1.[1] *(1 mark each)* Complete each of the following sentences with MUST, MIGHT, or CANNOT.

a. If A and B are square matrices of the same order, then $\mathrm{tr}(AB)$ ______________ be equal to $\mathrm{tr}(A)\mathrm{tr}(B)$.

Question 2.*(3 marks)* Find **all** matrices A that commute with $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$.

Question 3.*(3 marks)* Prove: If A is an $m \times n$ matrix and $A(BA)$ is defined, then B is an $n \times m$ matrix.

Question 4.*(3 marks)* Use the following properties of the trace:

1. $\mathrm{tr}(A \pm B) = \mathrm{tr}(A) \pm \mathrm{tr}(B)$
2. $\mathrm{tr}(AB) = \mathrm{tr}(BA)$

to show that there does not exists matrices A and B such that $AB - BA = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. *Hint: Prove by contradiction.*

[1] From or modified from a John Abbott final examination